

AMENDMENT TO THE CLAIMS:

This listing of claims will replace all prior versions of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) An apparatus comprising:

a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein in each said at least one aperture, the tapered portion of each said at least one aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion;

cross-linkers attached to an inner wall of said at least one aperture; and
a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said at least one aperture, attached at or near the circumference of one end of the cylindrical portion of said at least one aperture.

2. (Original) The apparatus of claim 1, wherein the substrate is chosen from the group consisting of glass, carbon, polymeric materials, and semiconductors.

3. (Original) The apparatus of claim 1, wherein the macro-cyclic ring has a rigid phenylethynyl backbone.

4. (Original) The apparatus of claim 1, wherein a biological or chemical probe is attached to the macro-cyclic ring such that the biological or chemical probe extends into and rests between at least a portion of the surfaces of the inner walls of the cylindrical portion of said aperture.

5. (Original) The apparatus of claim 4, wherein the biological probe comprises a single strand sequence of DNA.

6. (Previously Presented) The apparatus of claim 1, wherein the substrate comprises a layer of Silicon Nitride, a layer of Silicon, a layer of Silicon Oxide, a layer of Silicon, and a layer of Silicon Nitride.

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Currently Amended) A method comprising:

providing a substrate having at least one aperture having a tapered portion with a top diameter greater than the bottom diameter and wherein the in each said at least in each said at least one aperture, the tapered portion of the said at least one aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; cross-linkers attached to an inner wall of said at least one aperture; and a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said at least one aperture, attached at or near the circumference of one end of the cylindrical portion of said at least one aperture; and

functionalizing said aperture to bind to a specific biological or chemical moiety.

11. (Currently Amended) A method comprising:

providing a substrate having at least one aperture having a tapered portion with a top diameter greater than the bottom diameter and wherein the in each said at least in each said at least one aperture, the tapered portion of the said at least one aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; cross-linkers attached to an inner wall of said at least one aperture; and a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said at least one aperture, attached at or near the circumference of one end of the cylindrical portion of said at least one aperture; wherein said aperture is functionalized to bind to a specific biological or chemical moiety; and

passing a sample through said aperture while simultaneously measuring the variation in ionic current across the depth of said aperture.

12. (Previously Presented) The apparatus of claim 1, wherein the macro-cyclic ring has at least one functional group coupled thereto.

13. (Previously Presented) The apparatus of claim 1, further comprising electrodes positioned to allow measurement of a current across the aperture.

14. (Previously Presented) The apparatus of claim 13, further comprising a device coupled to the electrodes for measuring the current across the aperture.

15. (Previously Presented) The apparatus of claim 14, wherein coupling of a biological or chemical material to a functional group coupled to the macrocyclic ring causes a change in the current across the aperture, the change being detectable by the device.

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (New) The method of claim 10, wherein functionalizing said aperture includes coupling at least one functional group to the macro-cyclic ring.

20. (New) The method of claim 11, wherein the macro-cyclic ring has at least one functional group coupled thereto, thereby functionalizing said aperture.